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ABSTRACT

A cognitive explanation of achievement-related behavior is developed. It is suggested that high and low achievers diverge behaviorally in the achievement situation because they conceptualize the causes of success and failure in different ways. The results of a study are presented which show that subjects high in achievement needs tend to attribute outcome to effort more than subjects who are intermediate or low in achievement needs. Having established that these different levels of achievement motivation can be characterized in terms of their cognitive dispositions with respect to causal attribution, the author presents further evidence which supports his hypothesis that these different cognitions of causality are the antecedent conditions of achievement-related behavior; that is, the behavior characteristic of a given achievement group will be elicited whenever the causal cognition typical of that group is induced. This formulation is contrasted with the current view of achievement which differentiates achieving behavior on the basis of differences in the affective states of pride or shame elicited by the task situation. (TL)

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The Cognitive Determinants of Achieving Behavior

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August 1970

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ABSTRACT

A cognitive explanation of achievement-related behavior is developed. It is suggested that high and low achievers diverge behaviorally in the achievement situation because they conceptualize the causes of success and failure in disparate ways. This formulation is contrasted with the current view of achievement, which accounts for individual differences in achieving behavior by differences in the affective states of pride or shame elicited by the task situation.

It is first shown that Ss who differ in achievement level also differ in their cognitions about the causes of their outcomes. Rotter's distinction between internal and external attributions of causality is considered as the source of a possible difference among achievement groups in their cognitive orientations. Prior evidence indicates that internality-externality and achievement are related, but not in the one-to-one fashion conjectured by Rotter. Heider's analysis of the attribution of causality into the components of ability, effort, difficulty, or luck was administered to Ss along with a measure of achievement motivation. It was found that Ss high in achievement needs had a greater tendency to attribute outcome to effort than either an intermediate or a low achievement group. Also, Ss intermediate in achievement needs were the only group who attributed outcome to the luck dimension. Thus each level of achievement motivation can be uniquely characterized in terms of its cognitive dispositions with respect to causal attribution.

Evidence is next presented for the hypothesis that the disparate cognitions discovered above are the antecedent conditions of achievement-related behavior. Specifically, it is hypothesized that any conditions which encourage the attribution typical of a given achievement group will result in the behavior which is also characteristic of that group. Prior experiments dealing with the differential effects of skill versus chance task orientations are seen to support this conclusion. Two new experiments are reported which constitute a direct test of the above cognitive hypothesis. In both these experiments, one group of Ss was instructed that its outcome on a task would be determined by both ability and effort, while a second group was told that only ability would influence outcome. These two orientations differ from each other in the same way that the high achiever's typical attribution differs from the low achiever's. In Experiment 2, it was found that high achievers in the ability-effort oriented group performed better than high achievers in the ability oriented group. In Experiment 3, the ability-effort group of high achievers showed a greater preference for intermediate-risk tasks than high achievers in the ability group. In both these experiments, the ability-effort group differed behaviorally from the ability group in the same way that uninstructed high achievers are known to differ from uninstructed low achievers. The attributional instructions did not, however, differentially affect the behavior of low achievers. This finding is tentatively explained as the result of an interaction between the instructions and the low achiever's attributional tendencies.

The data thus indicate that (1) high and low achievers attribute causality differently, and that (2) these attributions seem to elicit the behavior characteristic of their corresponding achievement groups. This provides strong evidence for the cognitive explanation of achieving behavior.

CHAPTER I

INTRODUCTION

The following studies develop a cognitive explanation of individual differences in achievement-related behavior. It is contended that persons who differ in their level of achievement motivation behave differently in the same situation because this situation elicits in them disparate cognitions. The argument for this contention proceeds in two stages. First, it is established that persons who differ in achievement level also differ in the way they typically conceptualize the causes of success or failure at a task. Second, evidence is presented that these cognitions about causality are in fact antecedent conditions of achievement-related behavior; that is, that the behavior characteristic of a given achievement group will be elicited whenever the causal cognition typical of that group is induced.

Such an explanatory pattern is very different from the current conception of achievement motivation which stems from the work of McClelland, Atkinson, and their colleagues (McClelland, Atkinson, Clark, and Lowell, 1953; Atkinson, 1957, 1964; Weiner, 1970). Atkinson (1964), for example, postulates that individual differences in achievement-related behavior are accounted for by the relative strengths of two motive systems: the motive to succeed (Ms) and the motive to avoid failure (Maf). Ms is defined as the capacity to experience the affect of pride upon goal-attainment, while Maf is taken to represent the capacity to experience the affect of shame at goal-nonattainment. A person's resultant level of achievement motivation is further defined as the difference (Ms-Maf) between the strengths of these two motives. Thus, a high achiever is a person for whom $Ms > Maf$, while a low achiever is one for whom $Maf > Ms$. In Atkinson's view, then, the reason that a high achiever acts differently from a low achiever when both are presented with the same task situation is that this situation elicits in each of them different degrees of the affects of pride or shame. Such an account can appropriately be called an affective explanation of achieving behavior, in contrast to the cognitive explanation proposed above.

The present study is organized as follows: in Chapter II below, prior attempts to relate achievement motivation with causal cognitions will be reviewed. Chapter III will present an experiment which succeeds in differentiating among high, intermediate, and low achievement groups in terms of how they conceptualize the causes of success and failure. In Chapter IV, evidence from previous studies will be summarized which strongly supports the hypothesis that a subject's cognition about causality is a determinant of how he behaves in the achievement situation. Chapters V and VI will present two new experiments which test this hypothesis directly. Finally, Chapter VII will consist of a discussion of the more general theoretical import of the analysis and data presented.

CHAPTER II

THE COGNITIVE CORRELATES OF ACHIEVEMENT MOTIVATION

The possibility that achievement motivation is related to cognitions about causality has been raised by Rotter (1966). Rotter discusses this hypothesized relationship in terms of the personality dimension of internality-externality. This dimension is thought to refer to the way persons typically view the locus of causality of events in their environment. A highly internal person is said to have a "generalized expectancy" that what occurs to him is contingent upon his own behavior. Conversely, a highly external person views his outcomes as being relatively independent of his own actions.

Rotter offers the conjecture that high achievers tend to be internal in their ascription of causality, while low achievers tend instead to attribute causality externally. A number of attempts to find significant relationships between achievement level and the internality-externality dimension have proved inconclusive (Feather, 1967; Crandall, Katkovsky, and Preston, 1962; Lichtman and Julian, 1964; Odell, 1959). More recently, however, Weiner and Kukla (1970) have reported an experiment which demonstrates that these two dimensions are related. In this experiment, subjects attempted to predict each of a series of 50 random binary digits (0 or 1). Although the outcome on this task was determined only by luck, the subjects were instructed that both luck and skill in detecting hidden patterns within the series would jointly determine their outcome. Upon completion of the task, all subjects were asked to estimate how many of their correct guesses were obtained by the application of skill rather than by good luck. It was found that high and low achievers differed systematically in their causal attributions. Among successful (i. e., high-scoring) subjects, high achievers took personal credit for a greater number of correct guesses than did low achievers. However, in the failure (low-scoring) condition, high achievers claimed fewer correct guesses as a result of skill than low achievers did. These results clearly indicate the existence of a relationship between achievement motivation and causal ascription.

Whether the foregoing findings support the specific hypothesis that high achievers are more internal than low achievers is problematic. While such an interpretation can consistently be made, Weiner and Kukla were able to offer alternative interpretations which account equally well for the results obtained. Thus, although the relationship between achievement and attribution was considered demonstrated, it was not possible to formulate in general terms the precise nature of this interconnection.

The inconclusiveness of the Weiner and Kukla study may have been due to the fact that internality-externality is not the most appropriate dimension along which to differentiate the cognitive dispositions of high and low achievers. There may be other classifications of causal determinants which correspond more closely to the cognitive differences among achievement groups. One such alternative analysis is found in Heider's (1958) work. Essentially, Heider introduces a second dimension, stability-variability, in addition to internality-externality in terms of which causal attributions can be categorized. The resulting possibility of making finer distinctions among causal determinants then increases the likelihood of discovering more exact relationships between achievement and attribution.

With the Heiderian analysis, an outcome which is attributed internally can more specifically be ascribed either to relatively stable properties of the self which are expected to endure through a number of attempts to procure the outcome, or to relatively transient properties of the self which may or may not obtain on future trials. The stable internal attribute is identified with the person's ability to achieve the outcome, and the transient personal attribute is the degree of effort expended at achieving the outcome. Similarly, an external attribution may refer either to relatively stable or to fluctuating properties of the environment. The stable external attribute is the task's degree of *difficulty*, while the fluctuating external attribute is the degree of good or bad *luck* experienced.

It is evident that the Heiderian analysis uncovers ambiguities in the concepts of internality and externality which may mask attributional differences between groups. For example, an internal attribution, or equivalently, an attribution to "skill," may refer to the ascription of an outcome either to ability or to effort. However, one group of *S*s could conceivably be disposed to ascribe outco comes to ability but not to effort, while another group of *S*s may perceive its outcomes to be a function of effort but not of ability. Yet both such groups would be described as internal by Rotter's analysis.

In terms of the Heiderian scheme, there are a number of possible attributional differences between achievement groups which may have accounted for the results of Weiner and Kukla. The fact that failing high achievers attributed fewer correct guesses to "skill" than failing low achievers could be due to any or all of the following circumstances: (1) failing high achievers might have considered themselves less *able* than failing low achievers; (2) they might have ascribed less *effort* to themselves; (3) they might have considered the task more *difficult*, and so ascribed fewer points to skill even if their ability and effort attributions remained high. In addition, high achievers may or may not differ from low achievers in their attributions to luck.

The following experiment was conducted in order to determine how high and low achievers differ in their use of all four Heiderian attributional variables.

CHAPTER III

EXPERIMENT 1

Method. The Ss were 138 male UCLA undergraduates, some of whom were paid for participating in the experiment and some of whom were volunteers from introductory psychology classes. The study was conducted with groups ranging in size from 8 to 16.

Ss were first given the Revised and Condensed Achievement Scale for Males (Mehrabian, 1969). This test (Appendix 1) is a self-report inventory whose items are constructed in conformance with Atkinson's conception of achievement motivation as the resultant of the motive to succeed (Ms) and the motive to avoid failure (Maf). The score obtained on this scale is theoretically a measure of the resultant achievement tendency (Ms—Maf). Mehrabian has presented the validating evidence that this test correlates positively with standard measures of Ms and negatively with standard measures of Maf.

Each S then engaged in a digit-guessing task, which was introduced by the following instructions:

"I have in front of me a list of 50 numbers, either 0 or 1, in an order which is unknown to you. Your task is to guess whether the next number of my list is either 0 or 1.

You will write down your guess on the answer sheet which I have passed out, and then I will tell you what the number actually was. If your guess is correct, place a check on the line next to it. You will then be asked to make your next guess, and so on until all 50 guesses have been completed.

"Now this is a test of your synthetic as opposed to your analytic ability. By this we mean that there is no one definite pattern, like 010101, that you could easily detect and get all the answers correct from then on. But the list also is not random. Instead, there are certain general trends and tendencies in the list--perhaps a greater frequency of one kind of pattern over another. To the extent that you can become sensitive to those tendencies, you can make your score come out consistently above chance. Of course, your score also will be heavily influenced by luck. Even if you learn just exactly as much about the patterns as we expect, you could get a much higher total score just by being lucky in your guessing. Similarly, your score could be much lower just because of bad luck. To get a really accurate idea of where you stood, you would have to take the test a number of times so that the good and bad luck would average out."

The list of 0s and 1s read to the Ss was randomly constructed, so that the outcome was determined solely by chance. However, the instructions created an ambiguous situation which allowed performance to be perceived as attributable to any combination of ability, effort, luck, and task difficulty. *S*s were allowed 15 seconds to make each guess, with the correct answer read after every trial.

Upon completion of the task, *S*s added up their total number of correct guesses. They were then instructed to answer a written questionnaire (Appendix 4) consisting of the following five questions, each of which was to be answered by placing an X on a ten-point Likert-type scale anchored at both extremes and at the midpoint:

1. Ability--"How good are you potentially at this kind of task?" (1 = extremely low ability, 10 = extremely high ability.)
2. Effort--"How hard did you try to succeed at this task?" (1 = extremely low effort, 10 = extremely high effort.)
3. Difficulty--"How difficult do you think this task is?" (1 = extremely difficult, 10 = extremely easy.)
4. Luck--"Try to evaluate how lucky you were in your guessing." (1 = extremely unlucky, 10 = extremely lucky.)
5. Outcome--"Would you evaluate your score as a success or as a failure?" (1 = extreme failure, 10 = extreme success.)

Three different random orders of these five questions were employed.

Essentially the same digit-guessing task was used by Weiner and Kukla (1970), although the latter experiment investigated the internality-externality dichotomy rather than the four Heiderian attributional variables. Also, in the Weiner and Kukla study the Ss were assumed to have experienced success or failure depending upon whether the score they had obtained was high or low with respect to the total distribution of scores. The fifth question of the questionnaire was included in the present experiment to determine directly whether a S perceived himself as having succeeded or failed.

Ss were divided into high (Hi Ach), intermediate (Int Ach), and low (Lo Ach) achievement groups. The Hi Ach group comprised the highest one-third of all Ss in achievement score, while the Lo Ach group contained the lowest third of the distribution of achievement scores.

Results. Table 1 gives the correlation coefficients between reported outcome (question 5 of the questionnaire) and each of the four attributional variables. All the motive groups are seen to vary their estimation of ability with their outcome. However, only the Hi Ach group varies its effort attribution with outcome, while only the Int Ach group varies its luck estimation systematically with outcome. The Lo Ach group shows no consistent outcome correlates outside of ability. In addition, none of the groups in this experiment exhibited significant difficulty-outcome correlation. All significance levels remain unchanged when the correlation coefficients are calculated between attributional variables and objective outcome (number of correct guesses) rather than subjective outcome (the correlation between

TABLE 1

CORRELATIONS BETWEEN SUBJECTIVE OUTCOME AND ATTRIBUTIONAL VARIABLES FOR HIGH, INTERMEDIATE, AND LOW ACHIEVEMENT GROUPS

	Hi Ach	Int Ach	Lo Ach
	(n = 46)	(n = 44)	(n = 48)
Ability	+.46*	+.43*	+.42*
Effort	+.44*	.00	+.08
Difficulty	-.02	+.18	+.08
Luck	+.13	+.58*	+.09

* $P < .01$

TABLE 2

MEAN SELF-RATINGS ON THE ATTRIBUTIONAL QUESTIONNAIRE SCALES FOR HIGH, INTERMEDIATE, AND LOW ACHIEVEMENT GROUPS

	Hi Ach	Int Ach	Lo Ach
	(n=46)	(n=44)	(n=48)
Ability	6.58	5.89	5.78
Effort	6.46	6.41	6.37
Difficulty	4.78	4.73	4.66
Luck	4.70	5.02	4.80
Outcome	5.49	5.18	5.55

objective and subjective outcome was $r = +.44$). Finally, the effort-outcome correlation for the Hi Ach group was significantly greater than that for either the Int Ach or the Lo Ach groups ($p < .01$), and the luck-outcome correlation for the Int Ach group was significantly greater than that for either of the extreme achievement groups ($p < .01$).

Table 2 presents the mean self-ratings of the three achievement groups on each of the five scales of the questionnaire. The Hi Ach group had a significantly greater ability estimation than either the Lo Ach or the Int Ach groups (respectively, $t = 2.38$, $df = 92$, $p < .05$; $t = 1.90$, $df = 88$, $p < .10$). All other comparisons of overall means were nonsignificant.

Discussion. Table 1 enables us to determine how each group attributed its outcome on the task at hand. A high correlation between outcome and the attributional variable of, say, ability, indicates that the group in question perceived itself as relatively more able when its outcome was high than when its outcome was low. This is taken to mean that the ability dimension was utilized by this group to account for whether it succeeded or failed, i. e., that outcome was attributed at least in part to ability. Thus the data of Table 1 indicate that high achievers attributed their outcome to a combination of ability and effort; that intermediate achievers considered ability and luck to be determinants of their outcome; and that low achievers expected only the ability dimension to influence success or failure.

Attributions of causality are undoubtedly determined by situational factors as well as by the Ss' attributional dispositions. Even when the task is causally ambiguous, it is possible that its structure and accompanying instructions suggest or discourage some attributions for all Ss independently of their attributional tendencies. If Ss were asked to guess the outcome of a turn of a roulette wheel, it is to be expected that outcome would correlate significantly with luck for all levels of achievement motivation. Yet it would be inappropriate to conclude from this that attribution to luck is a part of the attributional tendency of all achievement groups. For this reason, only the differences in attribution found among achievement groups can be assumed to reveal their attributional dispositions. Thus, the data allow us to conclude only that high achievers consider effort to be a more salient determinant of outcome than do intermediate or low achievers, and that intermediate achievers have a greater tendency to ascribe outcome to luck than do the extreme achievement groups. The finding that none of the groups made systematic use of the difficulty variable leaves open the question of whether the achievement groups characteristically differ in their perceptions about this dimension. Similarly, the finding that all three achievement groups utilized the ability dimension allows us neither to affirm nor to reject the possibility that ability attribution is a cognitive tendency shared in common by all achievement levels. Clearly another study is called for, utilizing a task and instructions which make attribution to ability somewhat less plausible and attribution to difficulty somewhat more plausible than the task of Experiment 1. In this way, it can be hoped that any differential tendencies to ascribe outcomes to these variables can be uncovered.

The fact that intermediate achievers used the luck dimension to distinguish between success and failure while neither of the extreme achievement groups did, was unanticipated. It seems that, contrary to Rotter's conjecture, it is this group which must be considered external, while both high and low achievers are internal, although each in a different way. The usefulness of the Heiderian analysis of action is demonstrated by the fact that Rotter's concepts of internality and externality turn out to be incapable of distinguishing the cognitive dispositions of the extreme achievement groups.

The externality of the intermediate achievers is particularly surprising in view of the conceptualization of achievement motivation as the resultant of an approach and and an avoidance tendency. One would have expected that the Int Ach group, being on the whole intermediate in both the need to succeed (Ms) and the need to avoid failure (Maf), would have fallen between the Hi Ach and Lo Ach groups on any achievement-related variable. It seems likely that the attributional peculiarity of intermediate achievers is reflected in their achievement behavior. For example, if an intermediate achiever attributes a success primarily to good luck, he has more of an opportunity than others to commit the gambler's fallacy of supposing that his luck on a subsequent trial, and so his outcome, will be poor. Given the opportunity, he may then be more likely than either the high achiever or the low achiever to quit the task after a success. But the discovery of a behavioral measure related to achievement level on which the performance of the intermediate achiever stands in contrast to that of both the high and the low achiever would indicate the need for a revision in Atkinson's model for achievement behavior (1957, 1964). The latter entails that the tendency of the intermediate achiever to engage in an achievement task is under all specifiable conditions intermediate between those of the extreme achievers.

The fact that high achievers rate their abilities at an ambiguous task absolutely higher than either of the other two achievement groups may be taken as a confirmation of a prior conjecture of McClelland's (1961). He proposed that high achievers, having generally been successful in their past achievement-related activities, approach new and unfamiliar tasks with generalized overconfidence. The ability difference found in Experiment 1 is also consistent with evidence presented by Atkinson, Bastian, Earl, and Litwin (1960), indicating that high achievers exceeded low achievers in initial extimates of how well they expected to do at a novel task.

Finally, it must be recalled that the cognitive dispositions uncovered here are correlates of resultant achievement motivation, that is, of (Ms-Maf). If, as Atkinson maintains, Ms and Maf are relatively independent systems, each ought to have its own cognitive correlates which, when combined, yield the attributional dispositions discovered in Experiment 1. Whether this is the case can be directly resolved by administering separate measures of Ms and Maf in the context of another attributional experiment (such measures are discussed in Atkinson, 1964). This remains a task for the future.

CHAPTER IV

SKILL VERSUS CHANCE STUDIES

Having discovered cognitive differences among achievement groups, the argument outlined in Chapter I now calls for the demonstration that these differences account for the behavioral divergences known to obtain among these groups. Clearly, other interpretations of the results of Experiment 1 are feasible. It can still be maintained that individual differences in achieving behavior are, as Atkinson postulates, accountable for by differences in the affective dispositions to experience pride or shame, and that the disparate cognitions discovered reflect postbehavioral inferences drawn by the subjects on the basis of how they find themselves acting. Whether the cognition of causality is a determinant of achieving behavior rather than its product can in principle be easily resolved. For if cognition determines action, then a change in cognition will result in a corresponding change in behavior. Thus, if a high achiever acts the way he does because of the way he typically attributes causality, then any operation which increases the likelihood of such an attribution will also increase the likelihood of the behavior known to be characteristic of high achievers. More generally, we can expect that any set of conditions which favor the attributions typical of some achievement group will result in the behavior which is also typical of that group. This principle will subsequently be referred to as the cognitive hypothesis.

The above cognitive hypothesis receives support from a number of studies undertaken by Rotter and his colleagues. In these studies, the differential effects on performance of skill versus chance task instructions are investigated. One group of Ss is told that its outcome on the task at hand will be determined by how skilled they are, whereas a second group is instructed that its outcome will be purely a matter of chance. Since both groups are in fact presented with the same task, any differences between them must be due to the attributional instructions.

The relevance of these experiments to the cognitive hypothesis stems from the close relationship between the concepts of skill and chance, and the Heideraian variables of ability, effort, difficulty, and luck. As has been seen, skill refers ambiguously to some undetermined combination of ability and effort. Since effort is weighted in this combination, an attribution to skill is more like that of a high achiever than is a luck attribution. Further, it was found in Experiment 1 that attribution to luck is typical of the intermediate achiever. It follows then that if a skill orientation is induced in one group and a chance orientation in another, the skill group's attributional picture of the situation will correspond more closely to that of a high achiever than will the chance group's. The cognitive hypothesis then leads to the prediction that the skill group's performance will be more like that of a high achiever than will the chance group's. Under the additional assumption that the performance of intermediate achievers is intermediate between that of high and low achievers it can further be concluded that the behavioral differences between skill and chance groups will closely parallel the known differences between high and low achievement groups.

A review of the skill-versus-chance literature reveals that this predicted parallelism with achievement studies in fact occurs. On the following three behavioral parameters, data from the two groups of studies are in agreement.

1. Intensity of Performance. When constrained to an achievement task, high achievers work harder and perform better than low achievers (Lowell, 1952; Atkinson and Reitman, 1956). Correspondingly, a group which is instructed that its outcome is determined by skill performs better at a task than a group which is led to believe that its outcome is due solely to chance (Phares, 1962).

2. Shifts in Expectancy for Success. High achievers exhibit fewer unusual shifts in level of aspiration than low achievers; that is, they less frequently increase their expectancy for success after a failure or decrease their

expectancy for success after a success (Vitz, 1957; Moulton, 1965). Parallel to this is the finding by Phares (1957) that a skill-instructed group exhibits fewer unusual shifts in expectancy for success than a chance group.

3. Persistence. When faced with continuous failure at a task, high achievers persist longer than low achievers in attempting to succeed if the initial probability of success was high. If however the initial probability of success was low, low achievers persist longer than high achievers under continuous failure (Feather, 1961). This very specific finding also has a counterpart in the skill-versus-chance literature. James and Rotter (1958) arranged for one group to succeed 100% of the time and for another group to experience 50% successes. Both groups then underwent "extinction," that is, were given continuous failures. At the start of the extinction procedure, the 100%-success group undoubtedly perceived its probability of success as very high, whereas the 50%-success group viewed its probability of success as relatively lower. These two conditions thus correspond to those established in Feather's achievement study. As extinction proceded, the verbal expectancy for success was found to diminish more slowly for a chance-orientated subgroup than for a skill-oriented subgroup of the 50%-success group. However, within the 100%-success group, verbal expectancy for subsequent success extinguished more slowly for the skill-oriented

subgroup than for the chance-oriented subgroup. Under the reasonable assumption that expectancy for success is positively correlated with persistence at the task, these findings correspond in detail to the high-versus-low achievement data of Feather.

The consistent parallelism between the effects of skill and chance instructions and the behavior of high versus low achievers is strong evidence for the view that a person's achieving behavior is determined by his cognition of causality. After a consideration of only the correspondence in findings concerning unusual shifts in expectancy for success, Kogan and Wallach (1967) already have concluded:

> It is of considerable interest that the Rotter and Atkinson groups, proceding from different theoretical orientations, are converging upon a set of phenomena of mutual interest. The time may have come to examine the empirical links between the internal-external control dimension, on the one hand, and the variables of achievement and failure avoidance motivation on the other. There certainly appear to be striking conceptual similarities between the two sets of constructs. Yet . . . the constructs are embedded in different theoretical systems . . . . As two rival systems converge upon common phenomena, however, one or the other must eventually yield, or alternatively, a more comprehensive system incorporating both can be expected to emerge. (Kogan and Wallach, 1967, p. 191)

The cognitive explanation of achievement motivation being developed here seems a promising approach to such a more comprehensive system. The two experiments reported below constitute a direct test of the validity of this approach.

CHAPTER V

EXPERIMENT 2

A direct verification of the cognitive hypothesis entails the investigation of the effects of task orientations which correspond exactly to the attributional tendencies of high versus low achievers. In Experiment 1, high achievers were found to ascribe their outcomes to both ability and effort, while low achievers attributed success or failure to ability alone. As has already been discussed, this finding demonstrates only that these achievement groups differ in their tendency to attribute outcome to effort. Thus the experimental procedure which immediately suggests itself is to compare the performance of _S_s who are told that their outcome will be determined by effort with that of _S_s who are instructed that effort will not influence their outcome. But if the latter _S_s are simply given the negative instruction not to employ the effort variable, it leaves open to them the decision of how they will in fact attribute their outcome. These _S_s might conceivably settle on any alternative attributional account. Because of this possibility, the cognitive differences between an effort-instructed group and a no-effort-instructed group will not necessarily parallel the cognitive differences between high and low achievers. For this reason, it was decided to instruct one group of Ss that both effort and ability would determine outcome, and to tell a second group that only ability would influence its performance. The cognitive differences between these two groups explicitly correspond to those obtaining between high and low achievement groups. The cognitive hypothesis consequently leads to the prediction that these groups will diverge behaviorally in the same way that high and low achievers do.

In the following experiment, this hypothesis was tested for one of the fundamental behavioral parameters which distinguish high from low achievers. It is known that in an achievement situation, high achievers perform better at a task than low achievers (Lowell, 1952; Atkinson and Reitman, 1956). It was then predicted that an ability-effort-instructed group would perform better than an ability-instructed group.

Method. Ninety-one male undergraduate volunteers served as Ss in groups ranging in size from 11 to 20. All Ss were first administered the Revised and Condensed Achievement Scale for Males (Mehrabian, 1969). They then attempted to unscramble 20 anagrams of animal names (Appendix 7). Their score was the number of correct unscramblings obtained in 5 minutes.

One group of Ss, group A (n = 45), was read the following instructions before beginning work on the task:

"The reason that we're interested in this task is that we've found it to be a very pure measure of ability to reorganize material into new patterns. It's pure, in the sense that it's relatively unaffected by effort. Some people just seem to have the ability to have the correct word leap up at them, while others don't. And, within the time limit set, whether a person works very hard or takes it easy makes little difference in his score. This makes the task especially well-suited to studying the relation between personality factors and ability factors."

The intent of these instructions is to induce attributions solely to ability in this group.

Group AE (n = 46), on the other hand, was instructed as follows:

"The reason that we're interested in this task is that we've found that success in such reorganization of material into new patterns is heavily influenced by the amount of effort a person puts into the task, that is, the motivation he has to do well. Of course, there are differences in ability too; but even people with high ability for this kind of task do rather poorly if they do not give their full attention to searching for words, while people with somewhat lower ability can do quite well if they just search hard enough. For this reason, it's possible to use this task to determine which conditions lead to greater motivation among subjects."

Group AE's instructions thus encourage ascription of outcome to both ability and effort.

All *S*s were further divided at the median into high achieving (Hi Ach) and low achieving (Lo Ach) groups on the basis of their score on the achievement scale.

Results. The average number of correct unscramblings for all *S*s in group A was 10.71, while group AE obtained an average of 11.41 items correct. Although the difference between these two means is in the hypothesized direction, its magnitude does not approach statistical significance ($t < 1$).

Table 3 presents the mean scores on the anagram task with *S*s classified according to achievement level as well as attributional set. The data indicate that level of performance increases with both level of achievement motivation [$F(1,87) = 7.87$, $p < .01$] and when the task is introduced with ability-effort orienting instructions [$F(1,87) = 2.93$, $p < .10$], although the latter main effect only approaches significance. Of greater interest is the presence of a significant achievement-orientation interaction [$F(1,87) = 7.81$, $p < .01$]. The high achiever's customary superiority of performance over low achievers is evidenced only under the ability-effort orientation ($t = 3.89$, $df = 44$, $p < .001$); both achievement groups are seen to perform identically under the pure ability orientation ($t < 1$). In addition, while low achieving *S*s obtain essentially the same average score under both attributional orientations ($t<1$), high achievers solve more anagrams when they are initially told that effort as well as ability determines outcome ($t = 3.78$, $df = 43$, $p<.001$).

TABLE 3

MEAN NUMBER OF CORRECTLY UNSCRAMBLED ANAGRAMS,
ACCORDING TO ACHIEVEMENT LEVEL
AND ATTRIBUTIONAL INSTRUCTIONS

	Hi Ach	Lo Ach
Group A	10.71 (n = 28)	10.71 (n = 17)
Group AE	13.94 (n = 17)	9.93 (n = 29)

Discussion. Contrary to expectation, the attributional instructions affected only the high achieving Ss in the manner predicted by the cognitive hypothesis. The theoretical import of this finding, as well as a possible explanation for it, will be presented in the Discussion section of the closely related Experiment 3 below.

Independently of any more general considerations however, the results of Experiment 2 bear importantly on a current educational issue. Rosenthal and Jacobson (1968) report a study in which teachers were told that certain of their students, who were in fact randomly chosen, would exhibit unusual intellectual growth. Subsequent testing apparently revealed that these students did display greater intellectual development than control students of the same teachers. Weiner and Kukla (1970) attempted to explain this finding attributionally. The false expectations were assumed to lead the teachers to believe that the selected students had high ability, Hence, the failures experienced by these students were likely to be attributed by the teachers to insufficient effort. If the students were themselves to introject this evaluation, they would be developing the attributional pattern characteristic of a high achiever. Thus, to the extent that this cognitive disposition is a determinant of achievement strivings, they would perform at a higher level than the control students.

The results of Experiment 2 support a crucial step in this explanation. When effort is emphasized as a determinant of outcome, Ss do in fact perform at a higher level. In the present experiment, however, this is true only for Ss who are already high achievers. It may be that Rosenthal and Jacobson's results were carried by the high achievers in their sample of selected students. Alternatively, it is possible that the level of achievement motivation of young students is as yet so unstable that the teacher's behavior was capable of altering even the low achiever's cognitive interpretation of his experience.

In any case, it is clear that an educational principle of some significance is involved. Attempts to make a student view his scholastic outcome simply as "internally" determined is as likely to produce the low achiever's attributional scheme as the high achiever's. The distinction between ability and effort ascriptions is crucial, and general level of performance can be expected to improve only when the student is induced to accept effort as a prime determinant of outcome.

These considerations point once more to the fact that the internality-externality and skill-chance dimensions confound important attributional differences which are exposed by the Heiderian analysis. Both attributional orientations used in Experiment 2 are skill instructions; yet they lead to different behavioral consequences depending upon which attributional components of skill the S̲s are led to utilize.

CHAPTER VI

EXPERIMENT 3

The failure of the low achievers to react differentially to the attributional instructions in Experiment 2 could have been due to a greater resistance on their part to changing their attributional accounts of task situations. Such a resistance would presumably be overcome if the instructions were made more compelling. It was thought that the use of a task whose causal determinants were highly ambiguous (as in Experiment 1) would force all Ss to rely more on the instructions in determining their causal attributions, and that this would consequently result in the low achievers' acting in the hypothesized manner. Thus the following experiment employs such an ambiguous task to investigate the behavioral differences between ability-effort and ability oriented groups.

A different behavioral parameter was also studied. One of the most striking behavioral differences distinguishing high from low achievers concerns their relative preferences for risk-taking. It is generally found that, given a choice, high achievers prefer intermediate risk situations more frequently than low achievers, while the latter choose either extremely high or extremely low risk situations more frequently than high achievers (McClelland, 1958; Atkinson, Bastian, Earl, and Litwin, 1960; Atkinson and Litwin, 1960). The cognitive hypothesis consequently predicts that intermediate risks will be more often preferred under conditions which favor the high achiever's typical attributional pattern. More specifically, it was predicted that Ss given a pure ability orientation would exhibit less intermediate-risk preference than Ss who are told that effort as well as ability would determine their outcome.

Method. Forty-eight Ss, all male undergraduate volunteers, participated in the experiment in groups ranging in size from 6 to 20. As in the previous studies, they were first administered the Achievement Scale for Males. The Ss then undertook a variant of the digit-guessing task used in Experiment 1. Here, however, Ss had to guess which of the 10 digits from 0 to 9 occurred next on the E's list. Furthermore, they were given the option of making any number of guesses they liked on each trial. Thus they could try to get the correct answer the "hard way" by guessing only a few digits, the "easy way" by guessing many digits, or they could prefer to undertake an intermediate challenge by guessing neither very many nor very few digits. As in Experiment 1, the actual list of digits used was randomly constructed, so that a chance distribution of outcomes was obtained. However, all Ss heard the following instructions:

"I will have in front of me a list of 20 numbers, each one a digit between 0 and 9. Your task basically is to guess which digit is next on my list. On each turn, you will be allowed to write down any number of guesses you want on the answer sheet which I have passed out. When I call out the correct answer, you will write that answer down on the space provided next to your guesses. If your guesses include the correct answer, you will place a check on the line next to the correct answer, so that you can keep track of your score. Then you will make your next set of guesses and so on.

"Now the list of digits I will use is neither arbitrary, nor does it have a definite pattern like 2468024680 that you could detect and so get all correct from then on. Instead, the list is constructed according to certain general rules so that some numbers have a greater tendency to occur at some times than at others. Thus, if you are able to become sensitive to these tendencies, you can make your score come out consistently above chance. But you still would not be able to get them all right."

There were two experimental groups. After being read the above general instructions, group A was told the following:

"We've found on prior tests that the amount of ability a person has for this kind of task is the most important determinant of how well he does, while the degree of effort put into searching for patterns makes relatively little difference in the final score. Some people just seem to be good at the game, while others are not."

Group AE was read the following instead:

"We've found on prior tests that the amount of effort a person puts into trying out various patterns and looking over the previous series of correct answers is the most important determinant of how well he does. Of course, there are differences in basic ability for this kind of task. But even people with high ability do rather poorly if they do not give their full attention to the game, while people with somewhat lower ability can do quite well if they just try hard enough. Effort, then, is crucial."

Thus, group A was led to view the task as purely ability-determined, while group AE was told that effort as well as ability would determine their outcome.

After these instructions, but before the actual trials began, Ss were asked to predict what guessing strategy they would use, that is, how many times out of 20 they would guess just 1 number, how many times they would guess 2 numbers, etc. It was emphasized that this estimate in no way committed them to any particular performance once the game was under way.

The Ss then proceeded to record their 20 guesses. They were allowed 30 seconds to make each guess, after which the correct answer was read. For subsequent analysis, an intermediate-risk guess was considered to be a guess of 4, 5, or 6 digits, while a guess of 1, 2, 3, 7, 8, or 9 digits was taken to be an extreme-risk guess.

As in the previous experiment, all *S*s were divided at the median into high-achieving (Hi Ach) and low-achieving (Lo Ach) groups.

Results. The *S*s' actual risk preferences and their predicted risk preferences followed essentially the same pattern, although significance levels tended to be smaller in the latter data analysis. Only the actual risk preference data are discussed below.

Two *S*s did not make a full 20 guesses while engaged in the task. The data for these *S*s were eliminated in the following analyses.

The mean number of intermediate-risk guesses for all *S*s in group A ($n = 22$) was 6.64, whereas group AE ($n = 24$) chose an average of 10.00 intermediate-risk guesses out of the 20 trials. The difference between these two means approaches statistical significance in the hypothesized direction ($t = 1.96$, $df = 44$, $p < .10$).

Analysis of the data in terms of the *S*s' achievement level indicates that, as in the previous experiment, the effects of the attributional instructions are evident only for the Hi Ach group (Table 4). Analysis of variance reveals first that high achievers, on the whole, chose more intermediate-risk guesses than low achievers [$F(1,42) =$

4.73, $p < .05$], and that group AE was superior in this respect to group A [$F(1,42) = 6.12$, $p < .025$]. Superimposed over both these main effects was a significant interaction effect [$F(1,42) = 5.05$, $p < .05$]. The pattern of this interaction completely parallels that found for the data of Experiment 2. In condition AE, high achievers chose more intermediate-risk guesses than low achievers ($t = 2.98$, $df = 22$, $p < .01$], whereas these two motive groups did not differ in condition A ($t < 1$). Further, high achievers chose more intermediate-risk guesses in condition AE than in condition A ($t = 3.34$, $df = 20$, $p < .01$), while low achievers showed no such dfiferential performance between the two instructional conditions ($t < 1$).

TABLE 4

MEAN NUMBER OF INTERMEDIATE-RISK GUESSES CHOSEN, ACCORDING TO ACHIEVEMENT LEVEL AND ATTRIBUTIONAL INSTRUCTIONS

	Hi Ach	Lo Ach
Group A	6.58 (n = 12)	6.70 (n = 10)
Group AE	14.10 (n = 10)	7.07 (n = 14)

A comparison of high achievers in group A with high achievers in group AE reveals that the latter's greater preference for intermediate risks is due for the most part to their lesser preference for high-risk tasks. High achievers in group A made an average of 12.14 guesses of 1, 2, or 3 digits, whereas high achievers in group AE averaged only 5.80 such guesses ($t = 2.23$, $df = 22$, $p < .05$). Relatively few low-risk guesses were made by any Ss in this experiment. However, among the 10 high achievers who made at least one low-risk guess of 7, 8, or 9 digits, 9 were in group A and only 1 was in group AE ($\chi^2 = 5.81$, $df = 1$, $p < .02$). There is thus some indication that the high achievers of group A had a greater preference for extremes at either end of the risk-taking continuum. The distribution of high and low-risk guesses is essentially identical for the high achievers in group A, the low achievers in group A, and the low achievers in group AE, all three of these groups differing from the high achievers of group AE in the same way.

Discussion. In both Experiment 2 and Experiment 3, the behavior of high-achieving Ss confirmed the prediction of the cognitive hypothesis, while low-achieving Ss failed to be differentially affected by the attributional instructions. The differences in performance between high achievers in group A and high achievers in group AE can be accounted for only by the fact that the causal determinants of the task were described differently to these *S*s, since the experimental conditions were otherwise identical. Thus it is clear that cognition about causality is indeed a determinant of achieving behavior for these *S*s. It is however necessary to account for the apparent failure of the cognitive hypothesis with respect to the low-achieving group.

It is possible to devise a *post hoc* explanation for this failure which is consistent with the claims of the cognitive hypothesis. The original prediction that all *S*s would act more like high achievers in group AE than in group A was based on the assumption that all *S*s would interpret the instructions given to these groups in essentially the same manner. It may be, however, that the *S*s' own attributional dispositions interacted with the instructions to create discrepancies in their interpretations. The instructions that both ability and effort determine outcome are necessarily vague: it is up to the *S* himself to decide what degree of relative importance to assign to each of these two attributional variables. A high achiever, having already the tendency to ascribe outcome to effort, will presumably lay emphasis on effort here too, and so can be expected under these conditions to view the task very much as if he had been uninstructed. Similarly, a low achiever, carrying with him the disposition to underemphasize the effort component of a task, may construe an ability-effort orientation in much the same way that he interprets a pure ability orientation. Thus ability-effort instructions allow the high and the low achiever to attribute causality each in his typical fashion. On the other hand, if any *S* is told that the task is solely ability-determined, then (if he believes the instructions) attribution to effort is explicitly precluded and the attributional scheme of the low achiever is forced on that *S*. If this is the case, the cognitive hypothesis leads to the correct prediction that high and low achievers will diverge behaviorally in their customary way under an ability-effort orientation, whereas both high and low achievers will behave relatively like low achievers under an ability orientation.

The above *post hoc* explanation is amenable to direct test. Future replications of these findings can include an attributional questionnaire of the kind used in Experiment 1 to determine explicitly how the attributional instructions are interpreted. If the explanation offered above is correct, both high and low achievement groups will be found to attribute outcome under an ability-effort orientation in the same way as when they are uninstructed; further, both high and low achievers will attribute outcome under a pure ability orientation in the manner characteristic of the uninstructed low achiever.

In addition, a replication is called for which includes a third instructional group E, which is told that its outcome is due solely to effort. For the same reason that a pure ability orientation forces all Ss to disregard the effort variable in accounting for outcome, a pure effort orientation should force all Ss, including low achievers, to utilize the effort variable. The cognitive hypothesis then predicts that both high and low achievers in group E will act like uninstructed high achievers. Such an experimental addition is of the highest priority for the cognitive analysis of achievement motivation being proposed.

The arguments used to obtain predictions for Experiments 2 and 3, as well as to account for the unexpected interaction, are equally applicable to any established behavioral difference between high and low achievers. It is thus possible to submit these arguments to an indefinite number of further tests. For example, high achievers should exhibit fewer unusual shifts in expectancy for success than low achievers under ability-effort instructions, but this difference should be minimized under a pure ability orientation, etc.

It is also possible further to specify the results expected from skill-versus-chance experiments. Since a skill orientation is ambiguous as to whether ability or effort is the prime determinant of outcome while a chance orientation is relatively unambiguous, an interaction prediction similar to that made in Experiments 2 and 3 should also hold here. Under chance instructions, all Ss should behave like intermediate achievers; but given skill instructions, high and low achievers should both behave in their characteristic fashion. A curious consequence of this is that a very low achiever may act more like a high achiever (perform better, persist longer, etc.) under chance than under skill instructions, since the former corresponds to the attributional scheme of one higher in achievement motivation than himself. This prediction is, however, an uncertain one, since it has not generally been ascertained that the intermediate achiever's performance does in fact fall between those of the extreme achievers. It would in any case be instructive to replicate some of the skill-versus-chance studies of the Rotter group, obtaining also a measure of the Ss' level of achievement motivation.

CHAPTER VII

FURTHER ISSUES

The Generality of Attributional Dispositions. The question of the possible task specificity of the present results has already been discussed. A related problem concerns the degree to which the cognitive dispositions of the various achievement groups are specific to the achievement situation. Does the high achiever attribute outcome to effort only when he acts to procure achievement rewards, or is this same tendency active when he acts to acquire other incentives as well? Intuitively, it seems strange to suppose that a person's appraisal of the causes of a task's outcome are radically altered when, say, a money incentive is introduced into the situation. Nevertheless, the empirical evidence on this point is inconclusive. Atkinson and Reitman (1956) found no difference between high and low achievers in the persistence and quality of their performance when a variety of incentives not related to achievement were available. Yet, even though their behavior was identical, it is still possible that these two groups viewed causality in disparate ways. It may be that the high achiever's attributional pattern leads to better performance and greater persistence in the achievement situation, while the same causal attribution leads to different behavior when the sources of reward are changed.

The Generality of the Cognitive Viewpoint. Although only achievement-related phenomena were dealt with in the above studies, it may be that cognitive analyses of the kind effected here can productively be made for a much wider class of phenomena. There are certainly important motives other than achievement which seem *prima facie* to be just as amenable to a cognitive analysis. For example, a person P's need for social power is probably satisfied only when another person Q does what P wants him to do *and* Q's action is attributed by P to his own influence. There is a symmetry between this formulation and the fact that the achievement groups differ in whether they attribute a task's outcome to their own efforts. It is a reasonable hypothesis that persons high or low in need for power do not necessarily differ in the degree to which they relish power, but rather in the way they attribute the outcome of influence attempts.

Are *all* motivational differences ultimately to be reconstrued as cognitive differences? The obvious objection to this point of view is that people must surely also differ in the affective dimension. It seems undeniable that two people can in the same situation experience different degrees of pleasure or pain. But this objection is not conclusive in light of the results of a number of recent studies which indicate that affect is itself determined by cognition. Schachter and Singer (1964) showed that the affective state resulting from an epinephrine injection was determined by social cues which suggested to the subjects an interpretation for their physical symptoms. The influence of cognition on affect was also demonstrated in an experiment by Speisman, Lazarus, Mordkoff, and Davidson (1964). These authors found that both physiological and self-report indices of emotion while watching a stressful film changed radically with the content of an accompanying soundtrack which purported to explain what was being seen.

Lazarus (1967, 1968) has suggested that experiments like these lead us to abandon the view that affective states are motivational. He proposes that affect be removed from the causal sequence leading to a behavioral response and that it be viewed instead as an integral part of the response itself. For Lazarus, the immediate antecedents of behavior are cognitive "appraisals" of the situation rather than affective states. The investigations discussed in the present paper support Lazarus' theoretical position within the achievement domain. Whether this cognitive point of view proves to be valid for other behavioral domains remains to be seen.

It may be that a distinction between cognitive and noncognitive motives will ultimately arise. But the lines along which to draw such a distinction are at present obscure. The first requirement for dealing meaningfully with this issue would be a clarification of what the essential differences are between the affect construct and the connition construct. Presently, these differences are taken to be self-evident. Yet it is not easy to say just what we are to count as a cognitive state as apposed to an affective state.

The Cross-Cultural Generality of Cognitive Theories. It would surprise the author greatly if the Heiderian categories of ability, effort, luck, and difficulty proved to be the conceptual apparatus used by all peoples at all times to analyze causality. It seems much more likely that these categories are culture-bound. If so, the cognitive theory presented here must be taken as specifying how one prevalent cognitive schema among many possible others determines a class of actions. The study of other societies will have to generate new analyses of how their members select, engage in, and persist at tasks. It is to be hoped, however, that the successful undertaking of a number of such cognitive analyses will illuminate the properties of the more general mechanisms whereby thought is translated into action.

If cognitive dispositions concerning causality are culturally specific, and if, as has been argued here, these dispositions are the essential characteristics of achievement motivation, a rather startling conclusion follows. It seems that the categories of high versus low achievers may themselves be culturally specific. The culture-boundedness of devices which assess motive level has of course been generally recognized. But the present argument suggests that, independently of any problems of assessment, the notion of achievement motivation itself may not have any referent outside of a restricted set of societies. That is, in some societies, there may not exist members who evince the constellation of behavioral regularities which are associated with _any_ level of achievement motivation.

As long as the determinants of behavior are thought to be affective, it is possible to entertain the idea of the universality of the effects of pleasure and pain. This makes affective theoretical formulations sound as if they could reasonably be valid independently of any cultural context. The products of cognitive processes, however, strike one as inherently more conventional and open to cultural variation. But then, if as has been envisioned above, cognitive reinterpretations of affective mechanisms prove to be generallly correct, the status of many psychological theories will have to be reexamined. A theoretical position like Murray's (1938), McClelland's (McClelland, et al, 1953), or Atkinson's (1964), which is based on an enumeration of needs or motives, may be applicable only to the culture whose members provided the initial behavioral phenomena for analysis. Other cultures might generate very different lists of needs, that is, they may exhibit none of the behavioral regularities which are logically entailed by having any degree whatever of some particular motive.

This rather large issue is also involved in any proposed generalization concerning achievement motivation to female subjects. All of the experiments reported here, and indeed most experiments which have dealt with achievement motivation in any way, have used only males as subjects. An unreported replication of Experiment 1 with only female students, using a female version of Mehrabian's achievement scale, resulted in random data. Researchers in the area of achievement motivation are well aware of the general difficulty of obtaining significant results with a female population. Although this lack may be attributed to the failure of the assessment instruments, it is also possible that the concept of achievement motivation is useful only for a psychology of males. It is known that achievement strivings are generally discouraged in a subpopulation of women (French and Lesser, 1964). This discouragement is often thought of as causing females as a class to be relatively low in achievement level. The suggestion here however is that it may ultimately prove meaningless to describe females as either high or low in achievement motivation, just as it might prove meaningless to apply these categories to the members of a geographically separate culture. This suggestion assumes some likelihood only in view of the evidence that achievement motivation refers to one of a few patterns of cognition which are in principle open to infinite variation.

Toward a New Cognitive Theory. The present cognitive interpretation of achievement motivation suggests lines of research which will probably necessitate fundamental revisions in current achievement theories. In terms of the existing theories, it would be impossible to state how an attributional disposition which did not characterize any level of achievement motivation would influence action. For example, one could neither predict nor explicate how a person who attributed outcome to a combination of effort and luck would behave. Yet it is possible that for any specifiable combination of ability, effort, luck, and difficulty, subjects can be found who are disposed to attribute outcomes to that combination above all others. If this is the case, the two dimensions Ms and Maf of Atkinson's model are inadequate for classifying a population which can vary along four independent attributional dimensions. A new model will have to be constructed.

The general form required for such a cognitive model is discussed by Weiner, Frieze, Kukla, Reed, Rest, and Rosenbaum (in preparation). The explanatory patterns generated by this approach are very different from those produced by Atkinson's model. Consider for example the datum that high achievers persist longer in trying to succeed when experiencing continuous failure than do low achievers. Since a high achiever attributes failure at least in part to lack of effort, he can after a failure still reasonably expect to succeed by deciding to try harder the next time. The low achiever, however, attributing failure solely to insufficient ability, has no reason to hope that the next trial will be better than the previous one. It is easy to believe that under these circumstances the high achiever will persist whereas the low achiever will quit the task.

It is at present difficult to devise plausible cognitive accounts for other achievement-related data. The high achiever's greater preference for intermediate risks seems particularly resistant to any simple attributional explanation. It is however to be hoped that a new cognitive theory will be capable both of capturing the intuitive explanation outlined above of persistence phenomena, as well as of deriving risk preference phenomena from the same set of explicit principles.

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APPENDIXES

APPENDIX 1

THE ACHIEVEMENT SCALE FOR MALES
(REVISED AND CONDENSED)

(The symbols + and - below indicate whether the rating for that question is added or subtracted from the total to obtain the resultant achievement score. These symbols do not occur on the test as administered.)

The following questionnaire of personal attitudes consists of a number of items worded as "I'd rather do (A) than (B), such as, "I'd rather go swimming than go bowling." You are to indicate the extent of your agreement with each item using the scale below. Please note that if you give strong agreement to the statement, "I'd rather do (A) than (B)," this indicates that you prefer (A) much more than (B). If you give strong disagreement to the statement, "I'd rather do (A) than (B)," this indicates that you prefer (B) much more than (A).

Indicate, for each item, the extent of your agreement or disagreement with that item using a numeral (+3 to -3) in the space for that item on this page.

+3	Very strong agreement
+2	Strong agreement
+1	Slight agreement
0	No agreement and no disagreement
-1	Slight disagreement
-2	Strong disagreement
-3	Very strong disagreement

____ 1. I worry more about getting a bad grade than I worry about getting a good grade. (-)

____ 2. I would rather work on a task where I alone am responsible for the final product than one in which many people contribute to the final product. (+)

____ 3. I more often attempt difficult tasks that I am not sure I can do than easier tasks I believe I can do. (+)

____ 4. I would rather do something at which I feel confident and relaxed than something which is challenging and difficult. (-)

____ 5. If I am not good at something I would rather keep struggling to master it than move on to something I may be good at. (+)

____ 6. I would rather have a job in which my role is clearly defined by others and my rewards could be higher than average, than a job in which my role is to be defined by me and my rewards are average. (-)

____ 7. I would prefer a well-written informative book to a good movie. (+)

____ 8. I would prefer a job which is important, difficult, and involves a 50 per cent chance of failure to a job which is somewhat important but not difficult. (+)

____ 9. I would rather learn fun games that most people know than learn unusual skill games which only a few people would know. (-)

____10. It is very important for me to do my work as well as I can even if it means not getting along well with my co-workers. (+)

____11. Getting turned down after a job interview can be more painful to me than the pleasure of getting hired. (-)

____12. If I am going to play cards I would rather play a fun game than a difficult thought game. (-)

____13. I prefer competitive situations in which I have superior ability to those in which everyone involved is about equal in ability. (-)

____14. I think more of the future than of the present and past. (+)

____15. I am more unhappy about doing something badly than I am happy about doing something well. (-)

____16. In my spare time I would rather learn a game to develop skill than for recreation. (+)

____17. I would rather run my own business and face a 50 per cent chance of bankruptcy than work for another firm. (+)

____18. I would rather take a job in which the starting salary is $10,000 and could stay that way for some time than a job in which the starting salary is $5000 and there is a guarantee that within five years I will be earning more than $10,000. (-)

____19. I would rather play in a team game than compete with just one other person. (-)

____20. The thing that is most important for me about learning to play the guitar is being able to play a musical instrument very well rather than learning it to have a better time with my friends. (+)

____21. I prefer multiple-choice questions on exams to essay questions. (-)

____22. I would rather work on commission which is somewhat risky but where I would have the possibility of making more than working on a fixed salary. (+)

____23. I think that I hate losing more than I love winning. (-)

____24. I would rather wait one or two years and have my parents buy me one great gift than have them buy me several average gifts over the same period of time. (+)

____25. If I were able to return to one of two incompleted tasks, I would rather return to the difficult than the easy one. (+)

____26. I think more about my past accomplishments than about my future goals. (-)

APPENDIX 2

EXPERIMENT 1--INSTRUCTIONS

We're interested in the relationship between personality and certain kinds of abilities. We're going to give you a short personality test and afterwards a short new kind of ability test. First put your name on the personality test, the answer sheet, and the sheet headed "Questionnaire," which have been handed out to you. Put everything else aside for now and go ahead and take the personality test headed "Achievement Scale for Males." Make sure that you write your answers on the test itself. Answer these questions fairly rapidly, without mulling over any of them for too long.

(E then waited until all Ss indicated that they were through.)

Now for the ability test: it isn't going to be like other tests you've had in the past, so the instructions will be rather long and it's important that you listen to them carefully.

I have in front of me a list of 50 numbers, either 0 or 1, in an order which is unknown to you. Your task is to guess whether the next number on my list is either 0 or 1.

You will write down your guess on the answer sheet which I have passed out, and then I will tell you what the number actually was. If your guess is correct, place a check on the line next to it. You will then be asked to make your next guess, and so on until all 50 numbers have been completed.

Now this is a test of your *synthetic* as opposed to your *analytic* ability. By this we mean that there is no one definite pattern, like 010101, that you could easily detect and get all the answers correct from then on. But the list also is not random. Instead, there are certain general trends and tendencies in the list--perhaps a greater frequency of one kind of pattern over another. To the extent that you can become sensitive to those tendencies, you can make your score come out consistently above chance. Of course, your score also will be heavily influenced by luck. Even if you learn just exactly as much about the patterns as we expect, you could get a much higher total score just by being lucky in your guessing. Similarly, your score could be much lower just because of bad luck. To get a really accurate idea of where you stood, you would have to take the test a number of times so that the good and the bad luck would average out.

(*E* asked if there were any questions about the task. All such questions were answered by rereading the appropriate portions of the instructions. *Ss* then made their 50 guesses. The list of binary digits used was: 101001000011 0110111000011010011100001111011000110.)

Now add up the total number of guesses you made correctly and enter it in the space on the Answer Sheet marked "Total."

The test you just took is very new, and psychologists have only recently begun to study such synthetic abilities. For this reason, there are several questions we'd like you to answer concerning how you view this task and your performance on it. Please take the sheet headed "Questionnaire" and try to answer the questions on it as accurately as you can. Read the instructions for each question carefully so that you fully understand what we're trying to get at.

APPENDIX 3

EXPERIMENT 1--ANSWER SHEET

	Answer	Correct?		Answer	Correct?
1.			26.		
2.			27.		
3.			28.		
4.			29.		
5.			30.		
6.			31.		
7.			32.		
8.			33.		
9.			34.		
10.			35.		
11.			36.		
12.			37.		
13.			38.		
14.			39.		
15.			40.		
16.			41.		
17.			42.		
18.			43.		
19.			44.		
20.			45.		
21.			46.		
22.			47.		
23.			48.		
24.			49.		
25.			50.		

TOTAL ______________

APPENDIX 4

EXPERIMENT 1--QUESTIONNAIRE

For each of the following five questions, place an X in one of the ten spaces which most closely corresponds to your answer. Please make certain that every answer is between two vertical lines marking one of the ten spaces. None of the spaces corresponds to the exact midpoint of the scale.

I. Luck.

The total score you obtained on the task you just took was influenced by pure luck as well as by synthetic ability. Try to evaluate how lucky you were in your guessing. Remember, the items got right because you followed an appropriate pattern are not due to luck--just consider what proportion of your pure guesses ended up being correct.

/__/__/__/__/__/__/__/__/__/__/
1 2 3 4 5 6 7 8 9 10

extremely unlucky	midpoint	extremely lucky

II. Ability.

How much synthetic ability would you say you have? How good are you potentially at this kind of task, given that you try as hard as you can?

/__/__/__/__/__/__/__/__/__/__/
1 2 3 4 5 6 7 8 9 10

extremely low ability	midpoint midpo	extremely high ability

III. Effort.

How hard did you try to succeed at this task? Did you give it all the care and attention you could, or did you perform it without much effort?

/__/__/__/__/__/__/__/__/__/__/
1 2 3 4 5 6 7 8 9 10

extremely low effort	midpoint	extremely high effort

IV. Difficulty.

How difficult do you think this task is? Independent of your own level of ability, could very many people score quite high on the test, or does it require a high degree of ability to do well?

/___/___/___/___/___/___/___/___/___/___/
1 2 3 4 5 6 7 8 9 10

extremely difficult
midpoint
extremely easy

V. Outcome.

How would you evaluate the score you obtained on the synthetic ability task? Do you consider it a success or a failure?

/___/___/___/___/___/___/___/___/___/___/
1 2 3 4 5 6 7 8 9 10

extreme failure
midpoint
extreme success

APPENDIX 5

EXPERIMENT 1 - DATA

Subject Code	Achievement Score	Objective Outcome	Subjective Outcome	Ability	Effort	Difficulty	Luck
1	-17	25	6	8	5	3	2
2	+ 3	27	7	6	6	6	4
3	+41	28	3	6	3	5	5
4	+15	26	1	7	6	8	1
5	- 3	23	6	5	5	6	6
6	+15	27	6	3	4	4	7
7	+10	26	4	4	8	5	5
8	+ 5	25	1	4	9	1	5
9	+ 9	28	6	8	6	5	2
10	+21	28	6	6	6	5	6
11	+21	31	6	7	8	6	5
12	+15	28	6	6	6	6	4
13	+16	23	4	6	3	5	6
14	-11	22	3	6	7	4	4
15	+26	21	7	7	5	6	5
16	+18	29	6	6	7	5	4
17	+ 1	28	4	4	7	4	7
18	+12	26	2	8	8	4	2
19	+ 4	25	5	3	6	3	4
20	+ 7	28	6	6	3	5	5
21	+ 7	27	6	7	7	5	8
22	+ 5	30	6	7	5	5	7
23	+14	27	5	6	4	7	4
24	+15	29	6	6	8	2	5
25	+23	20	1	5	6	3	3
26	+ 8	24	5	7	9	2	1

Appendix 5 (cont'd)

Subject Code	Achievement Score	Objective Outcome	Subjective Outcome	Ability	Effort	Difficulty	Luck
27	+12	30	5	3	4	3	7
28	+14	28	7	9	1	8	8
29	+34	22	5	8	1	9	1
30	-14	29	6	6	6	6	6
31	-15	29	7	7	6	5	4
32	+22	26	6	7	6	4	4
33	+ 5	29	6	6	7	10	5
34	+28	28	5	7	7	7	7
35	-13	28	5	5	4	4	7
36	+34	31	9	9	9	10	7
37	- 6	30	7	7	6	6	6
38	+22	27	5	6	8	4	1
39	+38	25	3	6	6	10	5
40	+25	30	8	8	10	1	6
41	+22	20	3	7	4	3	3
42	+10	30	6	8	8	3	5
43	+ 6	18	7	6	8	4	7
44	0	31	5	5	4	2	4
45	+21	31	5	6	7	4	5
46	+ 6	25	4	7	4	3	4
47	+30	26	4	4	3	5	5
48	+23	31	8	8	7	3	4
49	+28	29	7	8	6	7	7
50	+ 6	25	5	6	5	6	5
51	-10	22	3	5	7	6	4
52	- 3	29	6	4	2	2	7
53	- 4	21	3	3	6	5	5
54	+27	29	2	9	3	7	4
55	- 7	34	7	8	8	5	6

Appendix 5 (cont'd)

Subject Code	Achievement Score	Objective Outcome	Subjective Outcome	Ability	Effort	Difficulty	Luck
56	+10	21	4	3	7	5	3
57	+ 3	27	6	7	6	8	4
58	+15	25	6	6	8	6	6
59	+20	33	7	8	4	4	4
60	- 1	28	6	7	7	3	5
61	+14	27	4	4	3	5	3
62	+21	22	6	6	10	3	4
63	+ 4	23	3	4	5	6	4
64	- 4	20	5	6	8	4	7
65	+21	30	7	8	7	5	6
66	- 2	30	5	3	7	6	2
67	+ 3	32	6	7	9	8	5
68	+12	29	3	8	8	3	7
69	+37	45	9	9	9	3	6
70	-13	30	6	6	6	5	5
71	- 6	30	6	8	5	4	6
72	+15	30	6	6	6	3	6
73	+24	23	5	6	6	4	4
74	+19	24	5	4	10	7	6
75	+14	25	3	5	6	4	4
76	+10	28	6	7	7	5	6
77	+ 8	26	6	6	7	8	7
78	+ 4	24	5	3	4	8	7
79	- 5	26	5	4	6	6	3
80	+19	25	6	6	8	7	3
81	+ 1	20	4	8	8	2	6
82	+14	30	9	9	9	7	7
83	- 1	29	6	6	7	4	4
84	-14	25	4	7	4	8	4

Appendix 5 (cont'd)

Subject Code	Achievement Score	Objective Outcome	Subjective Outcome	Ability	Effort	Difficulty	Luck
85	+ 8	23	5	4	3	4	3
86	+ 5	27	9	8	10	2	2
87	+25	27	7	6	9	3	5
88	+13	27	7	4	6	4	8
89	- 9	25	5	5	8	5	3
90	+11	29	6	7	7	5	6
91	- 1	27	5	4	8	2	5
92	-10	30	3	7	8	4	2
93	+ 3	23	3	4	4	3	6
94	+42	26	2	2	5	2	5
95	+22	22	3	8	7	2	7
96	+20	23	8	7	9	3	4
97	+15	29	7	7	10	2	4
98	- 2	35	7	7	7	5	4
99	+12	29	6	7	9	3	5
100	+ 4	23	5	5	8	1	5
101	- 2	28	7	6	7	5	3
102	+16	28	7	8	9	3	4
103	-17	23	7	2	7	2	7
104	- 4	30	9	9	10	6	5
105	+19	19	5	5	4	3	5
106	-21	24	4	6	8	7	5
107	+26	26	5	8	7	4	2
108	+ 6	32	6	7	7	6	5
109	- 1	26	9	6	6	10	6
110	+11	31	7	7	7	6	6
111	-16	29	8	7	7	3	6
112	-20	26	5	7	5	4	5
113	-26	34	7	7	5	5	3

Appendix 5 (cont'd)

Subject Code	Achievement Score	Objective Outcome	Subjective Outcome	Ability	Effort	Difficulty	Luck
114	-17	29	7	6	4	4	7
115	+20	22	5	5	9	7	5
116	+ 9	26	6	6	6	6	6
117	+ 9	23	5	4	5	3	7
118	+19	20	8	8	4	4	6
119	+ 7	23	6	8	9	6	6
120	+ 5	27	3	2	6	5	3
121	+23	25	6	3	3	5	5
122	- 1	24	4	7	8	6	3
123	+16	27	6	7	7	4	5
124	+10	19	5	5	8	5	3
125	+24	25	5	9	8	10	6
126	- 1	24	5	5	8	3	4
127	+ 7	22	5	6	6	2	5
128	+21	25	4	3	3	5	7
129	+26	24	4	6	6	5	3
130	+32	27	7	7	9	4	3
131	+ 8	26	6	6	5	4	6
132	- 1	29	7	7	2	4	6
133	+17	24	4	6	9	2	7
134	+19	25	4	7	4	4	3
135	+ 6	21	1	1	7	5	2
136	+28	29	7	8	8	6	6
137	- 1	28	4	5	8	3	5
138	+19	26	7	6	8	2	2

APPENDIX 6

EXPERIMENT 2--INSTRUCTIONS

We're interested in the relationship between personality factors and level of performance on certain kinds of tasks. We're going to give you a short personality test now, and then we'll test your performance on a selected task. For now, put your name on the personality test you've received, and go ahead and take it. Answer the questions fairly rapidly, without mulling over any of them for too long.

(_E_ then waited until all _S_s indicated that they were through.)

Now for the task. It'll be familiar to many of you from magazines and newspapers. You'll be handed a list of English words, each one of which will have its letters scrambled into a random order. In this particular list, each word will be the name of a common animal. Your job is simply to unscramble the letters and discover what the word is. If, for example, the letters are TCA, you would rearrange them to CAT, which spells "cat." Next to each scrambled word on your list, there'll be a place for you to write down the unscrambled animal name. Your score on this task is just the number of words you correctly unscramble in a 5-minute work period.

(Group A was read the following:)

The reason we're interested in this task is that we've found it to be a very pure measure of ability to reorganize material into new patterns--it's pure, in the sense that it is relatively unaffected by effort. Some people just seem to have the ability to have the correct word leap out at them, while others don't. And, within the time limit set, whether a person works very hard or takes it easy makes little difference in his score. This makes the task especially well-suited to studying the relation between personality factors and ability factors.

(Group AE was read the following, instead:)

The reason we're interested in this task is that we've found that success in such reorganization of material into new patterns is heavily influenced by the amount of effort a person puts into the task, that is, the motivation he has to do well. Of course, there are differences in ability, too; but even people with high ability for this kind of task do rather poorly if they do not give their full attention to searching for words, while people with somewhat lower ability can do quite well if they just search hard enough. For this reason, it's possible to use this task to determine which conditions lead to greater motivation among subjects.

Are there any questions about the task? (Questions were answered by re-reading the appropriate portions of the instructions.) Then I'll hand out the list of scrambled words. Remember, you will have 5 minutes to work. You may use the blank part of the sheet as work space if you wish. Please do not turn over the sheet until I say go. When you do turn over the sheet, please put your name on it before starting to work.

(Ss were allowed 5 minutes to work on the anagrams.)

APPENDIX 7

EXPERIMENT 2--ANSWER SHEET

1.	EGIRT	(Tiger)
2.	AEKNS	(Snake)
3.	DEIPRS	(Spider)
4.	EKMNOY	(Monkey)
5.	ABBIRT	(Rabbit)
6.	AGLLIOR	(Gorilla)
7.	ACNOOR	(Racoon)
8.	EKRTUY	(Turkey)
9.	ABEERV	(Beaver)
10.	CCEHIKN	(Chicken)
11.	ABFFLOU	(Buffalo)
12.	EOMSU	(Mouse)
13.	EHNORT	(Hornet)
14.	AEHNPRT	(Panther)
15.	DILHOPN	(Dolphin)
16.	CEOOTY	(Coyote)
17.	AEFFGIR	(Giraffe)
18.	AEEHLNPT	(Elephant)
19.	ELRUUTV	(Vulture)
20.	BEFLRTTUY	(Butterfly)

APPENDIX 8

EXPERIMENT 2 - DATA

Group A			Group AE		
Subject Code	Achievement Score	Anagrams Correct	Subject Code	Achievement Score	Anagrams Correct
1	+ 1	10	101	+ 6	7
2	+11	6	102	+ 2	4
3	+10	15	103	- 7	8
4	+14	15	104	-26	12
5	-14	1	105	+12	19
6	- 3	14	106	- 6	12
7	+11	15	107	+ 2	14
8	+14	13	108	+ 3	13
9	+22	9	109	+31	16
10	+12	9	110	+25	13
11	+21	11	111	+19	16
12	+10	8	112	-11	10
13	+28	14	113	+ 1	15
14	+10	14	114	+ 5	12
15	+12	7	115	+ 3	13
16	+10	9	116	- 1	15
17	-11	14	117	+24	15
18	+ 4	10	118	+ 9	12
19	+ 4	12	119	- 5	4
20	+28	10	120	+ 7	8
21	+19	10	121	- 7	13
22	+12	13	122	+11	11
23	+16	7	123	-24	10
24	+ 1	17	124	+11	16

Appendix 8 (cont'd)

	Group A			Group AE	
Subject Code	Achievement Score	Anagrams Correct	Subject Code	Achievement Score	Anagrams Correct
25	+ 4	16	125	-16	7
26	+26	11	126	+14	10
27	-11	11	127	+32	13
28	+11	9	128	-21	8
29	-15	9	129	-10	1
30	0	11	130	- 9	13
31	+21	11	131	0	9
32	+25	11	132	+ 4	7
33	+13	10	133	+22	14
34	+18	14	134	+16	16
35	+11	10	135	-10	11
36	+41	12	136	+ 9	7
37	+ 2	10	137	0	15
38	+ 3	12	138	- 7	7
39	-10	5	139	+18	17
40	- 6	13	140	+ 2	13
41	+15	6	141	+14	9
42	-14	6	142	+10	12
43	+25	12	143	-12	8
44	+10	9	144	+12	13
45	- 7	11	145	+11	17
			146	+12	10

APPENDIX 9

EXPERIMENT 3--INSTRUCTIONS

We're interested in the relationship between personality and how people perform on certain novel kinds of tasks. First, we're going to give you a short personality test, and then you'll work on the new task. Please put your name on both pieces of material you have. Then go ahead and take the test called "Achievement Scale for Males." Make sure you write your answers on the test itself. Answer these questions fairly rapidly, without mulling over any of them for too long.

(E waited until all Ss indicated that they were through.)

Now for the new task. It isn't going to be like other tests you've had in the past, so the instructions will be rather long and it's important that you listen to them carefully.

I will have in front of me a list of 20 numbers, each one a digit between 0 and 9. Your task basically is to guess which digit is next on my list. On each turn, you will be allowed to write down any number of guesses you want on the Answer Sheet which I have passed out. When I call out the correct answer, you will write that answer down on the space provided next to your guesses. If your guesses include the correct answer, you place a check on the line next to the correct answer, so that you can keep track of your score. Then you will make your next set of guesses and so on.

Now the list of digits I will use is neither arbitrary nor does it have a definite pattern like 2468024680 that you could detect and so get all correct from then on. Instead, the list is constructed according to certain general rules so that some numbers have a greater tendency to occur at some times than at others. Thus, if you are able to become sensitive to these tendencies, you can make your score come out consistently above chance. But you still would not be able to get them all right.

Now, as to how you're to guess: on each turn, you can make any number of guesses you like. Naturally, the more numbers you guess, the better the chances are that you'll be right just by luck, and the fewer numbers you guess, the more likely it is that if you're right, it's due to skill. But you can play the game any way you like. You can make any number of guesses you want on any turn, and you can change the number of guesses you use on the next turn.

To help you decide on how you wish to play, the following information about the nature of the game may be helpful. You may use it or disregard it as you wish.

(Group A was then read the following instructions:)

We've found on prior tests that the amount of ability a person has for this kind of task is the most important determinant of how well he does, while the degree of effort put into searching for patterns makes relatively little difference in the final score. Some people just seem to be good at the game, while others are not. Of course, how hard you try is entirely up to you.

(Group AE was read the following, instead:)

We've found on prior tests that the amount of effort a person puts into trying out various patterns and looking over the previous series of correct answers is the most important determinant of how well he does. Of course, there are differences in basic ability for this kind of task. But even people with high ability do rather poorly if they do not give their full attention to the game, while people with somewhat lower ability can do quite well if they just try hard enough. Effort, then, is crucial. Of course, how hard you try is entirely up to you.

(The remainder of the instructions was read to all Ss.)

Now that you have all the available information about the nature of the game, there is one thing we want you to do before we actually start playing. On the left-hand side of the Answer Sheet, under the heading "Expected Performance," try to predict how many of each kind of guess you expect to make in the 20 trials--that is, how many times out of 20 you will guess just one number, how many times you'll guess two numbers, and so on. This prediction in no way commits you to anything when the game actually starts--you can still use any method of guessing that you like--but we'd like to see how your expected strategy differs from your actual strategy once you're into the game. Go ahead then and estimate what your guessing pattern will be like. Check to make sure that the total number of all guesses here is equal to 20.

(E waited until all Ss indicated that they were through.)

Now we're ready to start. Remember the rules: you write down some number of guesses, each one a digit between 0 and 9; I give the correct answer; you write that answer down and place a check next to it if it was in your set of guesses; then you make your next set of guesses, and so on. You will have 30 seconds for each turn. Are there any questions?

(Questions were answered by rereading the appropriate portions of the instructions. Ss then worked on the task. The list of numbers used was: 33656475699053764680.)

Now, under the heading "Resultant Performance" on the left-hand side of the Answer Sheet, write down the number of times you actually used each kind of guess--that is, the number of times you guessed just one number, the number of times you guessed two numbers, and so on--and next to that, write down the number of each kind of guess which included the correct answer.

APPENDIX 10

EXPERIMENT 3--ANSWER SHEET

Expected Performance

Number of times will guess:

just one number ___
two numbers ___
three numbers ___
four numbers ___
five numbers ___
six numbers ___
seven numbers ___
eight numbers ___
nine numbers ___

Resultant Performance

Number of times actually guessed:

just one number ___# correct ___
two numbers ___# correct ___
three numbers ___# correct ___
four numbers ___# correct ___
five numbers ___# correct ___
six numbers ___# correct ___
seven numbers ___# correct ___
eight numbers ___# correct ___
nine numbers ___# correct ___

	Guesses	Answer	Correct?
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

APPENDIX 11

EXPERIMENT 3 - DATA

Group A		Actual Risk Preference									Predicted Risk Preference								
Subject Code	Achievement Score	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
1	+ 7	4	9	5	1	0	0	0	0	1	(incomplete data)								
2	+31	3	5	3	1	5	0	3	0	0	5	5	0	0	5	0	5	0	0
3	+ 6	0	0	16	2	0	0	0	1	1	0	10	10	0	0	0	0	0	0
4	+12	0	1	5	7	6	1	0	0	0	3	4	4	3	3	2	1	0	0
5	-29	1	2	2	3	3	3	3	2	1	1	2	2	3	3	3	3	2	1
6	+ 5	1	1	6	8	3	1	0	0	0	2	3	3	4	4	4	0	0	0
7	+23	0	13	2	2	1	1	1	0	0	2	4	3	3	4	1	1	1	1
8	+39	0	0	8	0	6	0	0	0	6	0	0	9	0	5	0	0	0	6
9	+10	0	8	7	4	0	0	1	0	0	0	9	8	3	0	0	0	0	0
10	- 7	2	3	4	7	2	1	1	0	0	1	2	4	4	4	3	2	0	0
11	-15	0	0	2	8	9	0	0	0	1	4	5	4	4	3	0	0	0	0
12	+31	2	2	8	5	2	1	0	0	0	3	4	5	4	2	1	1	0	0
13	+13	1	0	10	5	2	0	0	0	2	1	0	10	4	4	0	0	0	1
14	-18	2	4	6	3	3	0	0	0	2	6	5	3	3	3	0	0	0	0
15	+33	2	3	10	3	0	0	0	0	2	5	5	5	0	0	0	0	0	5
16	+29	0	3	16	1	0	0	0	0	0	5	4	7	4	0	0	0	0	0
17	+ 1	9	5	5	0	0	0	1	0	0	10	8	2	0	0	0	0	0	0
18	-11	0	1	11	7	0	0	1	0	0	0	7	4	9	0	0	0	0	0
19	+ 7	7	7	3	2	1	0	0	0	0	2	4	8	4	2	0	0	0	0
20	+11	0	1	5	14	0	0	0	0	0	0	10	5	5	0	0	0	0	0
21	+20	(incomplete data)									0	0	0	4	6	0	0	0	10
22	+15	0	4	4	9	2	0	1	0	0	2	4	3	8	3	0	0	0	0
23	+ 9	5	6	8	1	0	0	0	0	0	5	8	5	2	0	0	0	0	0

Appendix 11 (cont'd)

Group AE		Actual Risk Preference									Predicted Risk Preference								
Subject Code	Achievement Score	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
101	+12	0	0	7	9	2	1	1	0	0	0	2	4	4	7	3	0	0	0
102	- 5	1	0	8	4	2	3	2	0	0	0	3	10	3	2	2	0	0	0
103	- 1	2	3	6	5	2	1	0	0	1	3	4	7	2	2	1	0	0	1
104	+ 1	0	1	3	4	8	4	0	0	0	0	1	2	3	5	8	1	0	0
105	+17	0	3	3	10	4	0	0	0	0	0	8	8	4	0	0	0	0	0
106	- 5	0	0	2	17	1	0	0	0	0	2	3	10	5	0	0	0	0	0
107	+ 7	0	1	13	3	3	0	0	0	0	0	1	4	9	4	2	0	0	0
108	+ 6	5	5	2	0	4	3	0	0	1	5	5	1	0	5	0	3	0	1
109	+ 2	2	3	4	4	6	0	1	0	0	2	1	2	2	10	2	1	0	0
110	+ 7	9	6	5	0	0	0	0	0	0	2	5	5	2	2	1	1	1	1
111	+16	0	2	5	8	4	1	0	0	0	0	1	8	4	5	2	0	0	0
112	- 6	7	4	7	0	1	0	0	1	0	3	3	3	5	4	2	0	0	0
113	+19	0	0	0	7	10	3	0	0	0	0	0	0	8	10	2	0	0	0
114	+28	(incomplete data)									0	0	0	0	0	0	0	0	20
115	-15	4	2	3	7	3	0	0	1	0	6	4	2	3	5	0	0	0	0
116	+ 6	0	20	0	0	0	0	0	0	0	5	15	0	0	0	0	0	0	0
117	+16	8	9	2	1	0	0	0	0	0	4	2	11	3	0	0	0	0	0
118	- 6	0	6	9	3	0	0	1	1	0	5	10	5	0	0	0	0	0	0
119	+17	0	0	0	20	0	0	0	0	0	0	0	0	20	0	0	0	0	0
120	- 6	4	3	6	5	1	0	0	0	1	5	7	5	1	1	0	0	0	1
121	+21	1	2	1	1	7	8	0	0	0	(incomplete data)								
122	+19	11	0	1	0	4	4	0	0	0	1	1	1	4	5	2	2	2	2
123	+10	3	0	0	0	17	0	0	0	0	0	0	0	0	20	0	0	0	0
124	+ 9	0	0	0	5	13	2	0	0	0	(incomplete data)								
125	- 3	0	4	10	3	2	0	1	0	0	3	4	4	5	4	0	0	0	0